CONTHERM

INSTRUCTION MANUAL

CAT 2050 - 2400

STANDARD OVENS

CONTHERM SCIENTIFIC LIMITED
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(MANUAL6/2000.005) MARCH 1999

WARRANTY STATEMENT

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CONTHERM Scientific Company will guarantee CONTHERM equipment for a period of twelve months from the date of installation against faulty workmanship and fabricated materials. This guarantee covers the replacement of component parts found to be defective and authorised labour charges during this period.

Should a malfunction occur or condition develop beyond reasonable acceptance the company will accept responsibility for returning the unit to its factory specification at no cost to the Purchaser providing that the operating instructions have been observed and the defect is due solely to faulty design, material and workmanship. That the defective part be returned, freight paid to the nearest sales service office, the Company shall service the affected component and despatch, freight prepaid, within ten working days of receipt. Units outside the warranty period will be accepted and repairs will be covered under an extension of the above for 90 days.

In remote installations where it is not possible for the company's or agents' engineers to attend, authority may be given to allow the Purchaser to arrange such service.

The Purchaser is required to remit the purchase price of the unit to the supplier within the terms of that supplier's condition of sale. CONTHERM Scientific Company will accept no liability or shall its agents for consequent damage of any kind due to a malfunction or component failure.

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IMPORTANT All electrical servicing **must** be carried out by suitably qualified personnel only.

SECTION 1 DEFINITION OF TERMS

For the purpose of our standard specifications the following definitions shall apply:

a) WORKING SPACE
That portion of the internal space which is above the lowest shelf and not less than 3cm from any wall (including roof).

b) CABINET TEMPERATURE
That temperature at the centre of the working space.

c) SPATIAL VARIATION
The difference between the midrange of all measured temperatures obtained at one site and that at another site for those sites which give the greatest difference.

d) TEMPORAL VARIATION
The maximum value of the temperature range obtained for the standard site with the greatest range throughout the test interval.

e) TEMPERATURE DRIFT
Any long term changes in cabinet temperature during continuous operation of the closed cabinet.

f) TEMPERATURE OVERSHOOT
Any excess of actual over desired cabinet temperature during a heating up period.

g) TEMPERATURE REPRODUCIBILITY
Temperature regained without alteration to controls.

h) TEST INTERVAL
Interval of time to which the steady state characteristics apply (Max 1 hour).

NB: All the above apply with an **empty** chamber.
For definitions and test methods refer: **AS2853 : 1986** (and Appendices)

SECTION 2 INTRODUCTION AND SPECIFICATIONS

The CONTHERM 2000 series range of ovens has been expressly designed to give the widest choice of operating conditions consistent with high reliability and low cost, the addition of microprocessor control gives additional versatility and resolution while improving the degree of temperature control.

All specifications are quoted for a cabinet temperature of 105°C with an ambient temperature of 20°C.

- **Construction -** High quality stainless steel interior, full fibreglass insulation, with latching door catch and corrosive resistant epoxy powder coated exterior.

- **Safety -** Fitted with an independent user adjustable Hi-Limit completely separate from normal controls.

- **Convection -** All units come with mechanical convection fan systems.

- **Electrical -** All quoted at 105°C - ZP20 Micro-Controller mechanical Convection.
  - Designed to NZS6200 / AS3100:1994 240V AC M.E.N
- **EMC** - Complies with AS/NZS 2064: 1997

PERFORMANCE:

a) Temperature:

Nominal Range	Amb +5°C -	300.0°C
Temporal Variation		± 0.3°C
Spatial Variation		± 2.5°C
Initial Overshoot		+2.0°C
Reproducibility		±0.5°C
Cold junction compensation		<0.05°C/°C
Dial resolution		1.0°C
Operating Ambient		10°C - 35°C
Mains Voltage Range		210-270 AC 50Hz

b) Ramp:

Adjustable ramp rate (within heating limitations) 0.0 - 9.9°C/min

NB: 0.0 and 9.9°C/min = no ramping, oven will use normal power operation.

c) Timer:

Timing range	1 minute - 99 hours 59 minutes
Timing Resolution	1 minute

NB: Timer does not start timing down **UNTIL** within 2.5°C of the temperature **SET POINT**.

SECTION 3 OPERATING INSTRUCTIONS

To set up unit for operation after unpacking and checking for damage proceed as follows:

1) Fit shelf runners, then shelves.

2) Select a location handy to a 10amp electrical outlet.

3) Bench Units - Place on solid top with clearance underneath to allow ventilation around entire cabinet. – Any shelf or ceiling must be **AT LEAST** 200mm from the top of the oven.

OPERATING CONTROLLER:

1) Plug cabinet into 230V Mains outlet.

2) Turn on main switch - The LCD should show all 8888s then display the current temperature in the cabinet.

3) Press and HOLD the temperature button (top) UNTIL the 'SET' LED comes ON then RELEASE. The `SET' LED above the LCD should now be ON!

4) While the 'SET' LED is ON use the 'UP' & 'DOWN' buttons to adjust the SET POINT to the desired temperature.

5) WAIT for the display to return to normal; the 'SET' LED will then go off.

6) The TIMER must now be set to run the cabinet - use the SAME method as for the temperature EXCEPT press the 'TIME' button instead.
NB: the symbol ` **[:]** ' means run **CONTINUOUSLY**.
Setting the TIMER to **0:00** turns the cabinet **OFF**.
If the cabinet has **TURNED OFF** after the completion of a TIMED operating period it is only necessary to PRESS and HOLD the TIMER button until the 'SET' led comes on to **REPEAT** the TIMED run.

7) The cabinet will now attempt to obtain the SET POINT and control until the TIMER runs out of time.

8) To look at the current TIME press the 'TIME' button for 2 seconds - the amount of time left will now be displayed continuously.
To display the TEMPERATURE continuously - press the 'TEMP' button for 2 seconds.

9) To CANCEL any Alarm (ie. 1- - -) PRESS and HOLD the 'TEMP' button until the 'SET' LED comes ON.

RAMP: Unless a specific ramp rate (how fast the temperature rises when going from one temperature to another) is required it is recommended that the Ramp setting be 0.0°C/min. This will allow the controller to find the best rate automatically. **NB**: The ramp rate is generally only useful for **SLOWING** the rate of temperature rise, rates above the cabinet's ability to heat will not be achievable.

MECHANICAL HI-LIMIT MONITOR

The mechanical hi-limit is provided as a secondary safety device to protect the cabinet from over temperature in the event of electronic controller failure.

To set the Mechanical Hi-Limit

Turn the Hi-Limit control FULLY CLOCKWISE.

Allow the cabinet to stabilise at the required operating temperature, then turn the Hi-Limit control anti-clockwise until the **MONITOR** neon comes on (or a slight 'click' is felt). Now turn the Hi-Limit control **SLOWLY CLOCKWISE** until the **MONITOR** neon goes off, then advance the Hi-limit clockwise 1-2 scale markings. This will set the Hi-Limit trip point about 3 - 4°C above the current cabinet temperature.

NB: If the power to the cabinet is **REMOVED** for **LONG** periods when the internal cabinet temperature is above 190°C the operating life of the fan motor will be greatly reduced. It is **ALWAYS** recommended that the cabinet be allowed to cool to ambient temperatures **BEFORE** being switched **OFF** or **UNPLUGGED**, this allows the fan motor to continue operating while the cabinet is cooling down and thus prolongs fan motor life.

WARNING: To prevent FIRE or SHOCK hazard, DO NOT expose this product to rain or any type of moisture.

FOR YOUR SAFETY

To ensure safe operation the three-pin plug supplied must be inserted ONLY into a standard three-pin power outlet which is effectively earthed through the normal building wiring.

Extension cords are NOT recommended.

The fact that the equipment operates satisfactorily does NOT imply that the power outlet is earthed and that the installation is completely safe. For your safety, if in any doubt about the effective earthing of the power outlet, consult a qualified electrician.

ALARMS

All alarms are indicated by a number and three dashes on the LCD and are accompanied by an audible alarm.
To **CANCEL** any Alarm (ie 1---) PRESS and HOLD the `TEMP' button until the 'SET' LED comes ON.

ALARM MEANING

1--- This means the cabinet is OVER or UNDER temperature. If UNDER temperature it could be due to the door being opened, otherwise check the cabinet to determine if the Internal fan is still operating and that the MECHANICAL Hi-Limit control is not interfering with normal operation.

3--- Preset alarm - The cabinet has lost its control settings due to an internal memory failure. Reset all control settings as desired.

4--- This means that the TEMPERATURE sensing probe has failed / overranged. (Type 'K' Thermocouple). Confirm controller set type by turning cabinet off at main switch, turn back on and while 8888's are displayed on LCD press the **'RAMP'** button - an answering 'BEEP' 'BEEP' should be heard, if the problem persists the connections to the probe and the probe condition should be investigated.

5--- The cabinet has lost its CALIBRATION setting. A calibration will have to be performed - See Calibration Section.

9--- This is a WATCHDOG alarm - The Electronic PCB has failed - Replace the controller.

CALIBRATION

Calibration should be carried out at 150°C with the thermometer in the centre of the working chamber with the chamber empty.

1) Place the Calibration Thermometer probe in the workspace centre, close the door and set the controller for 150°C, allow at least 1 hour to stabilise.

2) Read the temperature on the Calibration Thermometer.

3) To calibrate the cabinet -

   a) Press and HOLD the `TEMP' button until the 'SET' LED comes ON then release. The 'SET' led should now be ON.

   b) WHILE the 'SET' led is ON: Press BOTH `UP' & `DOWN' buttons **TOGETHER** - a beep will be heard and the word ` CAL' will appear briefly on the LCD display. Adjust the reading on the LCD display using the `UP' & `DOWN' buttons until it agrees with the Calibration Thermometer.
   NB: If when attempting to press BOTH buttons together, the temperature SET POINT adjusts either up or down - it means you are NOT pressing BOTH buttons at the SAME TIME! - if the 'SET' led is still on you should attempt 3(b) again, if the 'SET' led is OFF you should repeat from 3 (a).

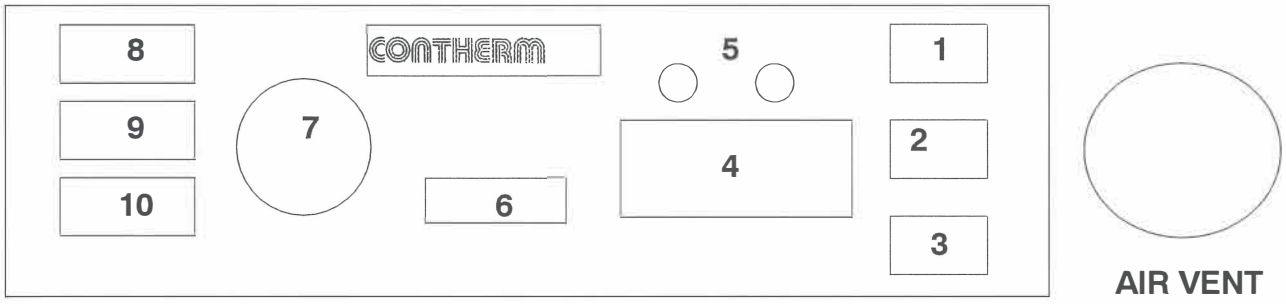
   c) WAIT for a further beep to occur, the LCD will briefly show '----' And then the **CALIBRATION CONSTANT**, this will be a number in the range 0.0 to 19.9. This figure SHOULD BE NOTED as it may be used to return to this calibration setting. The LCD will then briefly show another '---' and the controller will resume its role of normal operation.

   NB: If a '[[[[' sign appears on the display the cabinet is OUTSIDE its calibration display range and calibration should be performed at a slightly higher temperature.

4) Allow to stabilise again - the temperature should now be correct. If NOT repeat the procedure.

   NB: The calibration can only be performed within limits, if the calibration cannot be achieved a further fault exists.

CONTROL LAYOUT



The following controls are fitted on the Micro-controller Console:

1 Temperature adjustment button.
(Also used to adjust set points)

2 Ramp adjustment button. Sets Ramp Rate (°C/min)

3 Time adjustment button.
(Also used to adjust set points)

4 Liquid crystal Display - Gives readout of temperature in degrees centigrade OR elapsed time in hours and minutes.

5 LED Indicators - Left LED indicates when the element is ON. Right LED indicates when controller is in SET mode.

6 Refer "Caution" Instructions.

7 Mechanical Hi-limit set Adjustment Knob (No Scale).

8 Mains Switch and Illuminator combined - indicates power to controller board.

9 Hi-Limit Monitor Neon- will come on if power is being applied to heater element while mechanical Hi-Limit is tripped.

10 Fuse - contains a 10amp normal blow fuse.

SECTION 4 THEORY OF OPERATION

This CONTHERM General Purpose Oven uses a new single chip microprocessor electronic PID controller with a type `K' thermocouple as the temperature sensing element. The LCD gives a direct readout of SET POINT or Cabinet temperature in degrees centigrade.

The operation of the ZP20 controller is based on the thermocouple emf produced by the junction of dissimilar metals, ie, CHROMEL/ALUMAL or a type `K' thermocouple.

The thermocouple output is amplified 270 times by a chopper stabilised amplifier (7652) to provide an output 10mV/°C. This output is sent down two paths, one connected directly to the AN0 input of the microprocessor A/D converter while the other connects (via an attenuator network) to the AN3 A/D input. If the cabinet is setup as an OVEN then the microprocessor uses the voltage coming into the AN3 input otherwise it uses the AN0 input.

Cold junction compensation for the thermocouple is provided by a temperature sensor IC (LM35D) mounted in close thermal contact with the sensor terminations.

The outputs of the Microprocessor is used to switch a zero crossing triac driver (containing an led and a small triac internally), which in turn drives the heater triac. The zero-crossing driver ensures that radiated interference is kept to a minimum. An internal WATCHDOG monitors program execution and RESETs the microprocessor in the event of program failure.

Incoming AC mains power is conditioned by a varistor and inductor filter to prevent mains `spikes' from causing damage, then goes through a double wound transformer to reduce the AC to 10 volts and provide isolation.

The +5 Volt supply is stabilised by a standard 3 terminal regulator.

The type of cabinet (OVEN,INCUBATOR,MC or ,MCP) is selected by special button sequences during the power on period and retained by the eerom IC.

Calibration of the temperature is performed via the adjustment buttons and is retained in a eerom IC, settings will typically be retained for up to 100 years even in the absence of power.

SECTION 5 TROUBLESHOOTING AND MAINTENANCE

MAINTENANCE

The epoxy powder coated mild steel exterior is resistant to corrosion and spillage's and should be wiped with a damp cloth occasionally to maintain its appearance.

The fan motor bearings do not require lubrication under normal conditions however prolonged operation above 200°C will result in a reduced motor life.

The stainless steel interior and shelves should be kept clean with a damp cloth. Take care that the temperature probe is not damaged during cleaning of the interior base.
Any spillage's or breakages within the cabinet should be cleaned up immediately with the cabinet switched off and unplugged at the mains.

TROUBLESHOOTING:

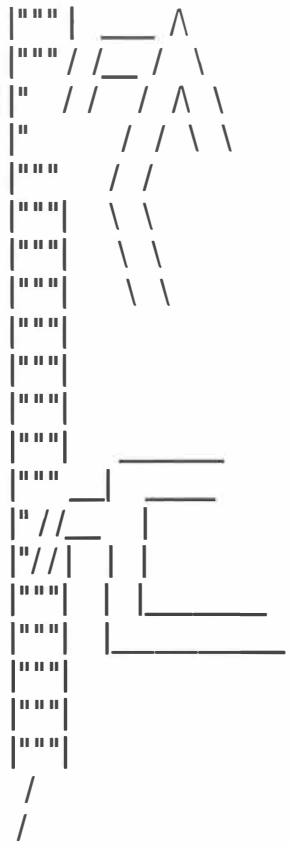
A) **CABINET COMPLETELY DEAD. NO MAINS NEON :**
- NO POWER TO CABINET, CHECK WALL SOCKET AND WALL SOCKET FUSES

B) **CABINET DEAD, BUT MAINS LIGHT ON :**
- CHECK CABINET FUSE.

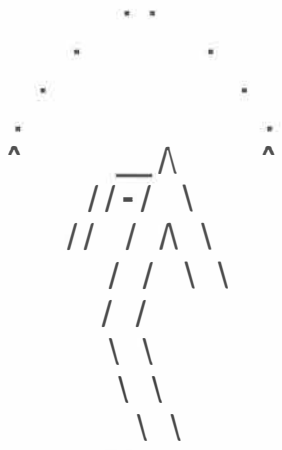
C) **LARGE TEMPERATURE VARIATION IN CABINET, CONTROLLER `HEATER' LED PULSING :**
- INTERNAL FAN NOT GOING (CHECK FOR AIR MOVEMENT INSIDE CABINET)
- CABINET OVERLOADED WITH SAMPLES, REMOVE SOME SAMPLES TO ALLOW BETTER AIR FLOW.
- LOOK FOR HI-LIMIT MONITOR NEON COMING ON, INDICATES MECHANICAL HI-LIMIT SET TOO LOW

D) **CABINET NOT FUNCTIONING NORMALLY or 4--- ALARM at 104° :**
- CONFIRM CONTROLLER SET TYPE BY TURNING CABINET OFF AT MAIN SWITCH, TURN BACK ON AND WHILE 8888'S ARE DISPLAYED ON LCD PRESS THE '**RAMP**' BUTTON - AN ANSWERING 'BEEP' 'BEEP' SHOULD BE HEARD.

ASSEMBLY OF ANTI-TILT SHELF RUNNERS



Vertical Slotted Shelf Strip



Fitted by a rotational movement

1) Remove vinyl protective film, if necessary, from runners.
2) Fit lug into selected slot in vertical shelf support and rotate down.
   NB: Lug may need easing further away from the runner with a screwdriver if insertion is difficult.
3) Check height of runners are parallel.
4) Fit Shelves.

Remove by the opposite action.

REMOVAL AND REPLACEMENT OF GP CONTROLLERS

The following should only be carried out by suitably qualified electrical personnel.

1) Remove power cord from wall socket and feed in through rear of cabinet, including plug.

2) Open door of cabinet and remove the element cover by undoing three PK screws across the front. Remove shelves and shelf runners. This exposes Safety Hi-Limit Probe. This is removed by undoing the one Phillips head self-tapping screw clamping Probe to roof (silver coloured, lying on roof). This Probe can now be carefully straightened to a vertical position and pushed partially back through hole in roof.

3) Undo screw securing main sensor to cabinet.

4) Fully withdraw Safety Hi-Limit Probe.

5) Remove "push-on" connectors at Element.

6) Remove two PK screws securing controller to cabinet.

7) Unscrew PHASE and NEUTRAL wires connecting PC Board to Terminal block and remove EARTH wire earthing Control Panel to Cabinet.

Controller should now be free to be carefully removed, trailing leads, etc out onto bench.

To Remove PC Board:

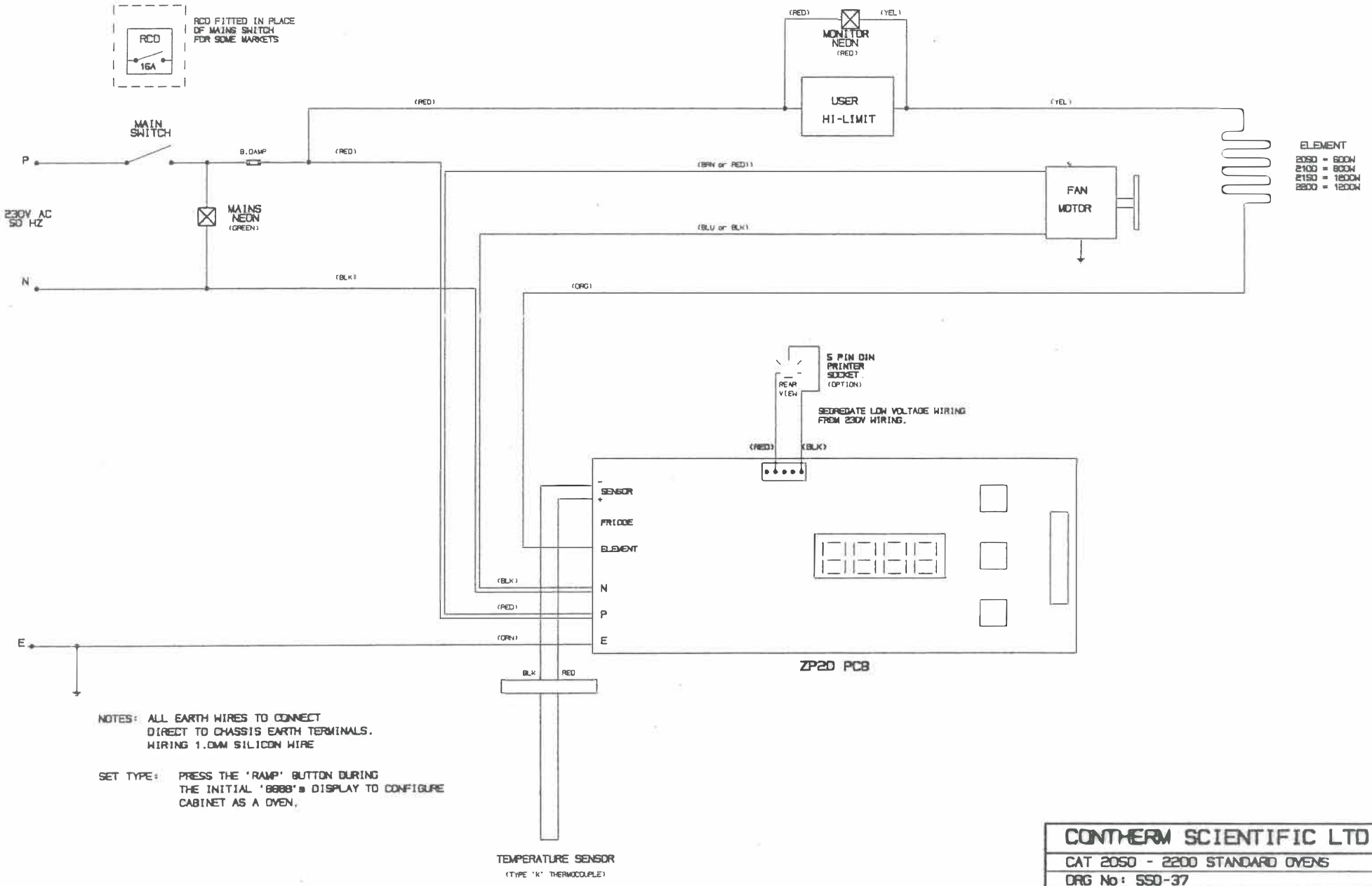
a) **ENSURE POWER CORD is REMOVED** from wall socket then Unplug socket from Controller PC Board.

b) Using suitable socket undo four 4mm securing nuts. Carefully NOTE position and size of SPACERS.

c) Remove PC Board.
List fault details, carefully pack, return to Agents for repair.
The refitting of the controller should be done in the reverse order as above, taking care when refitting the main sensor back through the hole in the false floor/back that it is not damaged in the process.

N.B: Check for loose wires that may have been missed, particularly the green earth wires.

WIRING DIAGRAM - 2050 - 2200 STANDARD OVENS - ZP20 PCB



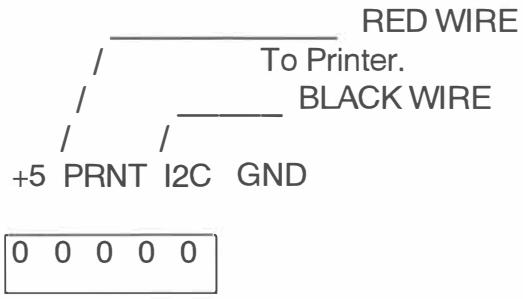
NOTES: ALL EARTH WIRES TO CONNECT DIRECT TO CHASSIS EARTH TERMINALS. WIRING 1.0MM SILICON WIRE

SET TYPE: PRESS THE 'RAMP' BUTTON DURING THE INITIAL '8888's DISPLAY TO CONFIGURE CABINET AS A OVEN.

CONTHERM SCIENTIFIC LTD	
CAT 2050 - 2200 STANDARD OVENS	
ORG No: SSO-37	
	Rev: A
Drawn: R KIRKWOOD	
Engineer: R KIRKWOOD	Created: 20-JLY-1995 08:32
Approved:	Changed: 25-JLY-1997 11:48

PRINTER OPTION

The ZP20 PCB comes complete with provision for driving the CONTHERM thermal printer. The RED and BLACK wires connect from the small expansion block on the ZP20 PCB to the printer socket.



ZP20 EXPANSION BLOCK

ALL MODELS

The return wire from the heating element(s) should be connected to the "ELEMENT" connection on the main PCB connector.

FAN MOTOR

The fan motor on ALL models should be permanently wired so that it is energised whenever power is applied to the cabinet.

The ZP20 PCB is equipped with a green "HEARTBEAT" LED adjacent to the green expansion block. When the cabinet is operating this LED should be PULSING about once per second. There is also a small (100mA) slow-blow glass fuse to protect the PCB. REMOVE ALL power from the unit (By removing the mains plug) BEFORE attempting to check this fuse.

Shelves	Cat 2050		GP2051
	Cat 2100		GP2052
	Cat 2150		GP2053
	Cat 2200/2300/2400		GP2054
Shelf Support Brackets (State Model when ordering)			GP2064
Fan Motors			GP2010
Elements	Cat 2050 (FINNED)	600W	GP2015
	Cat 2100 (FINNED)	800W	GP2016
	Cat 2150/2200 (FINNED)	1250W	GP2017
	Cat 2300 (FINNED)	1500W	GP2018
	Cat 2400 (FINNED)	1750W	GP2019
Temperature Sensor: Type `K' Thermocouple			GP2067
Hi-Limit Thermostat: Oven			GP2022
Mains Switch (Illuminated)			GP2033
Complete Control Panel: All Ovens (State Model)			GP2035
Control Knob			GP2324
Control Circuit Board: ZP20			GP2095
Fuse Holder			GP2071
Fuse		10Amp	GP2072
Monitor Neon			GP2073